WHAT IS CLAIMED IS:

1. An image display apparatus comprising an envelope which has a front substrate and a rear substrate opposed to each other and individually having peripheral edge portions sealed together,

a sealed portion between the front substrate and the rear substrate being sealed by means of a sealing member which has electrical conductivity and melts when supplied with current.

2. An image display apparatus according to claim 1, wherein the envelope has a frame-shaped sidewall situated between the respective peripheral edge portions of the front substrate and the rear substrate, and the sealing member is provided between the sidewall and at least one of the front and rear substrates.

3. An image display apparatus according to claim 1, wherein the sealing member is arranged in the form of a frame along the sealed portion on the peripheral edge of the envelope and has at least two electrode portions protruding outward from the sealed portion.

4. An image display apparatus according to claim 3, wherein the cross section of each of the electrode portions is greater than the cross section of any other portion of the sealing member.

5. An image display apparatus according to

claim 3, the two electrode portions are located individually in positions symmetrical with respect to the peripheral edge portions of the envelope.

6. An image display apparatus according to claim 1, wherein the sealing member contains In or an alloy containing In.

7. An image display apparatus according to claim 1, wherein the envelope has an electron source and a phosphor therein and is kept vacuum inside.

8. A method of manufacturing an image display apparatus which comprises an envelope having a front substrate and a rear substrate opposed to each other and individually having peripheral edge portions sealed together, the method comprising:

arranging an electrically conductive sealing member along a sealed portion between the respective peripheral edge portions of the front substrate and the rear substrate; and

sealing the sealed portion by supplying current to and melting the sealing member.

9. A method of manufacturing an image display apparatus according to claim 8, which comprises arranging a frame-shaped sidewall between the respective peripheral edge portions of the front substrate and the rear substrate, and providing said sealing member between the sidewall and at least one of the front and rear substrates, and supplying current to

the sealing member so to melt the sealing member.

10. A method of manufacturing an image display apparatus according to claim 8, wherein the sealing member is supplied with DC current.

11. A method of manufacturing an image display apparatus according to claim 8, wherein the sealing member is supplied with AC current in the commercial frequency band.

12. A method of manufacturing an image display apparatus according to claim 8, wherein the sealing member is supplied with AC current in the frequency band higher than the commercial frequency band from a source of AC current supply.

13. A method of manufacturing an image display apparatus according to claim 8, wherein In or an alloy containing In is used as the sealing member.

14. A method of manufacturing an image display apparatus according to claim 8, wherein the sealing member is arranged in the form of a frame along the sealed portion on the peripheral edge of the envelope and is formed having two electrode portions protruding outward from the sealed portion, the sealing member being supplied with current through the electrode portions.

15. A method of manufacturing an image display apparatus according to claim 14, wherein the cross section of each of the electrode portion is greater

than the cross section of any other portion of the sealing member.

16. A method of manufacturing an image display apparatus according to claim 14, wherein the two electrode portions are arranged individually in positions symmetrical with respect to the peripheral edge portions of the envelope.

17. A method of manufacturing an image display apparatus according to claim 8, which comprises setting the temperature of the front substrate and the rear substrate to be lower than the melting point of the sealing member at a point of time immediately before supplying current to the sealing member.

18. A method of manufacturing an image display apparatus according to claim 17, wherein the difference between the melting point of the sealing member and the temperature of the front substrate and the rear substrate at the point of time immediately before the sealing member is supplied with current is set within the range from 20℃ to 150℃.

19. A method of manufacturing an image display apparatus according to claim 8, wherein the sealing the sealed portion includes supplying current to the sealing member while arranging the envelope in a vacuum atmosphere.

20. A manufacturing method for an image display apparatus according to claim 19, wherein the front

substrate and the rear substrate are cooled to a temperature lower than the melting point of the sealing member without failing to maintain the vacuum atmosphere after the substrates are heated and degassed in the vacuum atmosphere, the sealing member is supplied with current to heat and melt the sealing member only, and the current supply to the sealing member is stopped so that heat from the sealing member can be conducted to the front substrate and the rear substrate to cool and solidify the sealing member, whereby the envelope is sealed.

21. A manufacturing method for an image display apparatus according to claim 20, wherein the peripheral edge portion of the front substrate or the rear substrate is released from mechanical restraint when the sealing member is supplied with current, so that the peripheral edge portion is allowed to be bent by heat as the envelope is sealed.

22. A manufacturing method for an image display apparatus according to claim 19, wherein an electron source and a phosphor are arranged in the envelope as the peripheral edge portion of front substrate or the rear substrate is sealed, whereby the envelope is kept vacuum inside.

23. An image display apparatus comprising an envelope which has a front substrate, a rear substrate opposed to the front substrate, and a sealed portion

between respective peripheral edge portions of the front substrate and the rear substrate,

the sealed portion having an electrically conductive sealing material which is heated and melted to seal the peripheral edge portions when supplied with current, and a conductive member having a melting point higher than the melting point of the sealing material and located on the peripheral edge portions.

24. An image display apparatus comprising an envelope which has a front substrate, a rear substrate opposed to the front substrate, and a sealed portion between respective peripheral edge portions of the front substrate and the rear substrate,

the sealed portion having a sealing material which is melted to seal the peripheral edge portions by heating, and a conductive member which is located in the sealing material to heat the sealing material and is heated when supplied with current.

25. An image display apparatus comprising an envelope which includes

a front substrate,

a rear substrate opposed to the front substrate,

a frame-shaped sidewall formed of a conductive member located between the front substrate and the rear substrate and on respective peripheral edge portions of front substrate and the rear substrate, and

a sealing material which is located at the

junction between the sidewall and at least one of the front and rear substrates and is heated and melted to seal the junction when the sidewall is supplied with current.

26. An image display apparatus comprising an envelope which has a front substrate, a rear substrate opposed to the front substrate, a frame-shaped sidewall located between the front substrate and the rear substrate and on respective peripheral edge portions of front substrate and the rear substrate, and a sealed portion which seals the junction between the sidewall and at least one of the front and rear substrates,

the sealed portion having a sealing material which is melted to seal the peripheral edge portions by heating and a conductive member which is located in the sealing material to heat the sealing material and is heated when supplied with current.

27. An image display apparatus according to claim 23, wherein the sealing material has electrical conductivity.

28. An image display apparatus according to claim 23, wherein the sealing material contains In or an alloy containing In.

29. An image display apparatus according to claim 23, wherein the sealing material is a material which melts or softens at the temperature of 300℃ or less.

30. An image display apparatus according to claim 23, wherein the conductive member has at least two connecting terminals extending outside the envelope and connectable to a power source.

31. An image display apparatus according to claim 23, wherein the cross section of the conductive member is not narrower than 0.1 mm^2.

32. An image display apparatus according to claim 23, wherein the conductive member contains at least one of Fe, Cr, Ni, Al, Cu, Ag, Co and Ti.

33. An image display apparatus according to claim 23, wherein the conductive member is formed of a material having a melting point of 500℃ or more.

34. An image display apparatus according to claim 23, wherein the thermal expansion coefficient of the conductive member accounts for 80 to 120% of the thermal expansion coefficient of the sealing material.

35. An image display apparatus according to claim 26, wherein the thermal expansion coefficient of the conductive member accounts for 80 to 120% of the thermal expansion coefficient of the sidewall.

36. An image display apparatus according to claim 26, wherein the thermal expansion coefficient of the conductive member is intermediate between the lowest and the highest of the respective thermal expansion coefficients of the front substrate, rear substrate, and sidewall.

37. An image display apparatus according to claim 26, wherein the envelope has an electron source and a phosphor therein and is kept vacuum inside.

38. A method of manufacturing an image display apparatus which comprises an envelope in which a front substrate and a rear substrate opposed to the front substrate are sealed at peripheral edge portions thereof, the method comprising:

providing the peripheral edge portions with an electrically conductive sealing material which is heated and melted when supplied with current and a conductive member having a melting point higher than the melting point of the sealing material; and

supplying current to the conductive member and the sealing material to heat and melt the sealing material and sealing the front substrate and the rear substrate at the peripheral edge portions thereof.

39. A method of manufacturing an image display apparatus which comprises an envelope in which a front substrate and a rear substrate opposed to the front substrate are sealed at the peripheral edge portions thereof, the method comprising:

providing the peripheral edge portions with a sealing material which is melted by heating;

locating a conductive member, which is heated when supplied with current, in the sealing material; and

supplying current to the conductive member to heat

and melt the sealing material and sealing the front substrate and the rear substrate at the peripheral edge portions thereof.

40. A method of manufacturing an image display apparatus which comprises an envelope in which a front substrate and a rear substrate opposed to the front substrate are sealed by an electrically conductive frame-shaped sidewall located between the substrates and on respective peripheral edge portions thereof, the method comprising:

providing the junction between the sidewall and at least one of the front and rear substrates with a sealing material which is heated and melted when supplied with current; and

supplying current to the sidewall to heat and melt the sealing material and sealing the front substrate and the rear substrate at the peripheral edge portions thereof.

41. A method of manufacturing an image display apparatus which comprises an envelope in which a front substrate and a rear substrate opposed to the front substrate are sealed by means of a frame-shaped sidewall located between the substrates and on respective peripheral edge portions thereof, the method comprising:

providing the junction between the sidewall and at least one of the front and rear substrates with a

sealing material which is melted by heating; and

locating a conductive member, which is heated when supplied with current, in the sealing material; and

supplying current to the conductive member to heat and melt the sealing material and sealing the front substrate and the rear substrate at the peripheral edge portions thereof.

42. A method of manufacturing an image display apparatus according to claim 38, wherein the conductive member is supplied with DC current from a power source.

43. A method of manufacturing an image display apparatus according to claim 38, wherein the conductive member is supplied with AC current in the commercial frequency band from a power source.

44. A method of manufacturing an image display apparatus according to claim 38, wherein the conductive member is supplied with AC current in the frequency band higher than the commercial frequency band from a power source.

45. A method of manufacturing an image display apparatus according to claim 38, wherein the temperature of the front substrate and the rear substrate is set to be lower than the melting point of the sealing material at a point of time immediately before the conductive member is supplied with current.

46. A method of manufacturing an image display apparatus according to claim 45, wherein the difference

between the temperature of the front substrate and the rear substrate and the melting point of the sealing member ranges from 20℃ to 150℃.

47. An image display apparatus comprising an envelope which has a front substrate and a rear substrate opposed to each other and a sealed portion between respective peripheral portions of the front substrate and the rear substrate,

the sealed portion including a sealing material and a high-melting conductive member in the form of a rectangular frame,

the high-melting conductive member having a melting point higher than that of the sealing material and having four or more projections protruding outward therefrom.

48. An image display apparatus, comprising:

an envelope which has a front substrate and a rear substrate opposed to each other and a sealed portion between the respective peripheral portions of the front substrate and the rear substrate;

a phosphor screen formed on an inner surface of the front substrate; and

a source of electron emission which is located on the rear substrate and emits an electron beam to the phosphor screen, thereby causing the phosphor screen to glow,

the sealed portion including a sealing material

and a high-melting conductive member in the form of a rectangular frame,

the high-melting conductive member having a melting point higher than that of the sealing material and having four or more projections protruding outward therefrom.

49. An image display apparatus according to claim 47, wherein the projections protrude individually from corner portions of the high-melting conductive member.

50. An image display apparatus according to claim 47, wherein the projections protrude substantially from the respective central portions of the sides of the high-melting conductive member.

51. An image display apparatus according to claim 47, wherein the projections of the high-melting conductive member include projections which project outside the front substrate and/or the rear substrate.

52. An image display apparatus according to claim 47, wherein the sealing material is an electrically conductive material.

53. An image display apparatus according to claim 52, wherein the sealing material is indium or an alloy containing indium.

54. An image display apparatus according to claim 47, wherein the high-melting conductive member contains at least one of Fe, Cr, Ni and Al.

55. A method of manufacturing an image display apparatus which comprises an envelope having a front substrate and a rear substrate opposed to each other, and a sealed portion including a high-melting conductive member having a melting point higher than that of the sealing material and sealing together respective peripheral portions of the front substrate and the rear substrate, the method comprising:

providing a rectangular frame-shaped high-melting conductive member having four or more projections protruding outward therefrom;

locating the high-melting conductive member between the respective peripheral portions of the front substrate and the rear substrate and arranging sealing materials individually between the front substrate and the high-melting conductive member and between the rear substrate and the high-melting conductive member; and

supplying current to the high-melting conductive member through the projections, thereby melting the sealing materials and sealing together the respective peripheral portions of the front substrate and the rear substrate.

56. A method of manufacturing an image display apparatus according to claim 55, wherein the front substrate, rear substrate, and sidewall are located in a vacuum atmosphere, and the high-melting conductive member is supplied with current after the high-melting

conductive member is positioned with respect to the front substrate and the rear substrate with the projections grasped.

57. A method of manufacturing an image display apparatus according to claim 55, wherein the sealing material is indium or an alloy containing indium.

58. A method of manufacturing an image display apparatus according to claim 55, wherein the high-melting conductive member contains at least one of Fe, Cr, Ni and Al.

59. An image display apparatus comprising an envelope having a front substrate and a rear substrate opposed to each other, and a sealed portion which seals together respective peripheral portions of the front substrate and the rear substrate,

the sealed portion including a frame-shaped high-melting conductive member and first and second sealing materials,

the first sealing material having a melting or softening point lower than that of the second sealing material, and the high-melting conductive member having a melting or softening point higher than those of the first and second sealing materials,

the high-melting conductive member being bonded to one of the two substrates by the first sealing material and to the other of the substrates by the second sealing material.

60. An image display apparatus according to claim 59, wherein the second sealing material is an insulating material.

61. An image display apparatus according to claim 59, wherein the second sealing material is frit glass.

62. An image display apparatus according to claim 59, wherein the melting or softening point of the second sealing material is not lower than 300℃.

63. An image display apparatus according to claim 59, wherein the thermal expansion coefficient of the second sealing material is within the range of ±20% of the thermal expansion coefficient of the front substrate or the rear substrate to be joined.

64. An image display apparatus according to claim 59, wherein the thickness of the second sealing material is 100 μm or more.

65. An image display apparatus according to claim 59, wherein the first sealing material is an electrically conductive material.

66. An image display apparatus according to claim 59, wherein the first sealing material is indium or an alloy containing indium.

67. An image display apparatus according to claim 59, wherein the melting or softening point of the first sealing material is lower than 300℃.

68. An image display apparatus according to

claim 59, wherein the high-melting conductive member contains at least one of Fe, Cr, Ni and Al.

69. An image display apparatus according to claim 59, wherein the melting point of the high-melting conductive member is not lower than 500℃.

70. An image display apparatus according to claim 59, wherein the thermal expansion coefficient of the high-melting conductive member is a value lower than the maximum value in the value range of ±20% of the respective thermal expansion coefficients of the front substrate and the rear substrate.

71. An image display apparatus according to claim 59, wherein the cross section of the high-melting conductive member is not narrower than 0.1 mm^2.

72. An image display apparatus according to claim 59, wherein the front substrate and the high-melting conductive member are joined by the first sealing material, and the rear substrate and the high-melting conductive member are joined by the second sealing material.

73. An image display apparatus according to claim 59, which further comprises a phosphor and an electron source for exciting, which are arranged in the envelope, and the envelope is kept vacuum inside.

74. A method of manufacturing an image display apparatus which comprises an envelope having a front substrate and a rear substrate opposed to each other

and in which respective peripheral portions of the front substrate and the rear substrate are sealed together by a sealed portion including a high-melting conductive member and first and second sealing materials, the method comprising:

providing a frame-shaped high-melting conductive member having a melting or softening point higher than those of the first and second sealing materials;

bonding the high-melting conductive member to the peripheral portion of one of the front and rear substrates by the second sealing material having a melting or softening point higher than that of the first sealing material;

opposing the one substrate to which the high-melting conductive member is bonded and the other substrate to each other and locating the first sealing material between the high-melting conductive member and the peripheral portion of the other substrate; and

supplying current to the high-melting conductive member, thereby melting or softening the first sealing material and bonding together the high-melting conductive member and the other substrate.

75. A method of manufacturing an image display apparatus according to claim 74, wherein the one substrate to which the high-melting conductive member is bonded and the other substrate are located in a vacuum atmosphere, and the high-melting conductive

member is supplied with current after the front substrate and the rear substrate are positioned.

76. A method of manufacturing an image display apparatus according to claim 74, wherein the first sealing material is indium or an alloy containing indium.

77. A method of manufacturing an image display apparatus according to claim 74, wherein the high-melting conductive member contains at least one of Fe, Cr, Ni and Al.

78. An image display apparatus comprising an envelope having a front substrate and a rear substrate opposed to each other, and a sealed portion which seals together respective peripheral portions of the front substrate and the rear substrate,

the sealed portion including a frame-shaped high-melting conductive member and a sealing material, the high-melting conductive member having a melting or softening point higher than that of the sealing material and having elasticity in a direction perpendicular to the respective surfaces of the front substrate and the rear substrate.

79. An image display apparatus according to claim 78, wherein the sealing material is interposed between the high-melting conductive member and the front substrate and/or between the high-melting conductive member and the rear substrate.

80. An image display apparatus according to claim 78, wherein the whole outer surface of high-melting conductive member is covered by the sealing material.

81. An image display apparatus according to claim 78, wherein the high-melting conductive member constitutes the sidewall of the envelope.

82. An image display apparatus according to claim 78, wherein the sealing material has electrical conductivity.

83. An image display apparatus according to claim 78, wherein the sealing material is indium or an alloy containing indium.

84. An image display apparatus according to claim 78, wherein the high-melting conductive member contains at least one of Fe, Cr, Ni and Al.

85. An image display apparatus according to claim 78, wherein the sealing material has a melting or softening point of 300℃ or less.

86. An image display apparatus according to claim 78, wherein the high-melting conductive member has a melting point of 500℃ or more.

87. An image display apparatus according to claim 78, wherein the thermal expansion coefficient of the high-melting conductive member is a value intermediate between the maximum and minimum values in the value range of ±20% of the respective thermal

expansion coefficients of the front substrate and the rear substrate.

88. An image display apparatus according to claim 78, which comprises a phosphor and an electron source for exciting the phosphor, which are arranged in the envelope, and the envelope is kept vacuum inside.

89. A method of manufacturing an image display apparatus which comprises an envelope having a front substrate and a rear substrate opposed to each other and in which respective peripheral portions of the front substrate and the rear substrate are sealed together by means of a sealed portion including a high-melting conductive member and a sealing material, the method comprising:

providing a frame-shaped high-melting conductive member having a melting or softening point higher than that of the sealing material and having elasticity in a direction perpendicular to respective surfaces of the front substrate and the rear substrate;

opposing the front substrate and the rear substrate to each other and locating the high-melting conductive member and the sealing material between the respective peripheral portions of the front substrate and the rear substrate;

lapping the opposed front and rear substrates on each other with the sealing material solidified, and elastically deforming the high-melting conductive

member in a direction perpendicular to the respective surfaces of the front substrate and the rear substrate; and

supplying current to the high-melting conductive member with the front substrate and the rear substrate lapped on each other, thereby melting or softening the sealing material and sealing together the respective peripheral portions of the front substrate and the rear substrate.

90. A method of manufacturing an image display apparatus according to claim 89, wherein the temperature of the front substrate and the rear substrate is set to be lower than the melting or softening point of the sealing material at a point of time immediately before the conductive member is supplied with current.

91. A method of manufacturing an image display apparatus according to claim 90, wherein the difference between the melting point of the sealing member and the temperature of the front substrate and the rear substrate at the point of time immediately before the high-melting conductive member is supplied with current is set within the range from 20℃ to 150℃.

92. A method of manufacturing an image display apparatus which comprises an envelope, having a front substrate and a rear substrate opposed to each other and individually having peripheral portions bonded

together, and a plurality of pixels formed in the envelope, the method comprising:

locating an electrically conductive sealing material on at least one of the front substrate and the rear substrate;

supplying current to and heating and melting the sealing material to bond together the respective peripheral portions of the front substrate and the rear substrate; and

controlling the current supply to the sealing material in accordance with the temperature dependence of the electrical resistance of the sealing material in heating the sealing material by the current supply.

93. A method of manufacturing an image display apparatus according to claim 92, wherein the sealing material is supplied with constant voltage when the sealing material is heated by the current supply, completion of melting of the sealing material is detected by the change of a current value for the sealing material, and the current supply is stopped when the completion of melting is detected.

94. A method of manufacturing an image display apparatus according to claim 93, wherein the completion of melting of the sealing material is detected by the change of inclination of the change of the current value for the sealing material.

95. A method of manufacturing an image display

apparatus according to claim 93, wherein the completion of melting of the sealing material is detected by the reduction of the current value for the sealing material.

96. A method of manufacturing an image display apparatus according to claim 92, wherein the sealing material is supplied with constant current when the sealing material is heated by the current supply, completion of melting of the sealing material is detected by the change of a voltage value for the sealing material, and the current supply is stopped when the completion of melting is detected.

97. A method of manufacturing an image display apparatus according to claim 96, wherein the completion of melting of the sealing material is detected by the change of inclination of the change of the voltage value for the sealing material.

98. A method of manufacturing an image display apparatus according to claim 96, wherein the completion of melting of the sealing material is detected by the increase of the voltage value for the sealing material.

99. A method of manufacturing an image display apparatus according to claim 92, wherein completion of melting of the sealing material is detected by the change of an electrical resistance value for the sealing material when the sealing material is heated by the current supply, and the current supply is stopped

when the completion of melting is detected.

100. A method of manufacturing an image display apparatus according to claim 99, wherein the completion of melting of the sealing material is detected by the change of inclination of the change of the electrical resistance value for the sealing material.

101. A method of manufacturing an image display apparatus according to claim 99, wherein the completion of melting of the sealing material is detected by the increase of the electrical resistance value for the sealing material.

102. A method of manufacturing an image display apparatus according to claim 92, wherein the sealing material is a metal.

103. A method of manufacturing an image display apparatus according to claim 102, wherein the metal contains at least one of In, Sn, Pb, Ga and Bi.

104. A method of manufacturing an image display apparatus according to claim 92, wherein the sealing material is heated by the current supply in a vacuum atmosphere.

105. A manufacturing apparatus for an image display apparatus which comprises an envelope, having a front substrate and a rear substrate opposed to each other and individually having peripheral portions bonded together, and a plurality of pixels formed in the envelope, the manufacturing apparatus comprising:

a power source which supplies current to and heat and melt a sealing material located on the peripheral portion of at least one of the front and rear substrates; and

a control section which receives at least one of a current and voltage value fed back from the power source when the sealing material is heated by the current supply and controls the current supply to the sealing material from the power source in accordance with the temperature dependence of the electrical resistance of the sealing material.

106. A manufacturing apparatus for an image display apparatus according to claim 105, wherein the control section measures at least one of the change of the current, voltage, and resistance value for the sealing material, thereby detecting completion of melting of the sealing material, in accordance with at least one of the current and voltage value fed back from the power source, and stops the current supply from the power source when the completion of melting is detected.